

WHAT IS CLAIMED IS:

1. An insulating paper piece for electric motors, in which electrical insulation in areas where single pole coils arranged on a stator core are adjacent is heightened, the insulating paper piece comprising:

two slot cell portions arranged in two slots of the stator core, in which insert portions of a single pole coil are received, and

two phase insulation portions, a phase insulation portion connecting a respective end of each of the two slot cell portions so as to form loops, and disposed to face against coil end portions of the single pole coil.

2. The insulating paper piece for electric motors according to claim 1, wherein one or plural loop-shaped unit configurations comprising the two slot cell portions and the two phase insulation portions are aligned in a direction of extension of the phase insulation portions, and extensions of the phase insulation portions are connected together to be unified, so that electrical insulation of the plural unit coils is achieved.

3. The insulating paper piece for electric motors according to claim 1, wherein the phase insulation portions comprise overlapping portions extended from both widthwise ends, so that when a plurality of the insulating paper pieces for electric motors are mounted on the stator core, the respective overlapping portions of the adjacent insulating paper pieces overlap one another.

4. The insulating paper piece for electric motors according to claim 2, wherein the phase insulation portions comprise overlapping portions extended from both widthwise ends, so that when a plurality of the insulating paper pieces for electric motors are mounted on the stator core, the respective overlapping portions of the adjacent insulating paper pieces overlap one another.

5. The insulating paper pieces for electric motors according to claim 1, wherein the phase insulation portions directly face the coil ends and form a three-dimensional shape to wrap the coil ends partially or wholly.

6. The insulating paper pieces for electric motors according to claim 2, wherein the phase insulation portions directly face the coil ends and form a three-dimensional shape to wrap the coil ends partially or wholly.

7. The insulating paper pieces for electric motors according to claim 3, wherein the phase insulation portions directly face the coil ends and form a three-dimensional shape to wrap the coil ends partially or wholly.

8. The insulating paper piece for electric motors according to claim 1, wherein the insulating paper piece for electric motors is a part of a standard sheet having a property of electrical insulation that is cut and bent.

9. The insulating paper piece for electric motors according to claim 5, wherein reinforcement sheets are applied at portions of the standard sheet to provide reinforcements giving greater thickness.

10. The insulating paper piece for electric motors according to claim 5, wherein the insulating paper piece for electric motors is used by partially cutting and bending the standard sheet having a substantially rectangular-shaped external form having a pair of longitudinal sides arranged substantially parallel to each other and a pair of transverse sides arranged substantially perpendicular to the longitudinal sides, the standard sheet comprising:  
 . at least two first cutting lines provided substantially parallel to the longitudinal sides;

two second cutting lines provided substantially parallel to the transverse sides so as to connect the two first cutting lines to each other to form a substantially rectangular-shaped central opening between the two first cutting lines;

a total of four third cutting lines, provided substantially parallel to the transverse sides and extending from both ends of the respective first cutting lines to extend in opposite directions from the central opening; and

a total of four fourth cutting lines provided between the transverse sides and the central opening, extending inward and substantially parallel to the transverse sides from the pair of longitudinal sides, wherein inner piece portions interposed between the pairs of third cutting lines opposed to and substantially parallel to each other and outer piece portions interposed between the pairs of fourth cutting lines opposed to and substantially parallel to each other are bent in a manner to cause the respective first cutting lines and the longitudinal sides which are adjacent to each other to approach each other, whereby at least two slot cell portions having a substantially U-shaped cross section can be formed, and those portions which are interposed between the third cutting lines and the transverse sides form the phase insulation portions.

11. The insulating paper piece for electric motors according to claim 7, wherein the insulating paper piece for electric motors is used by partially cutting and bending the standard sheet having a substantially rectangular-shaped external form having a pair of longitudinal sides arranged substantially parallel to each other and a pair of transverse sides arranged substantially perpendicular to the longitudinal sides, the standard sheet comprising:

at least two first cutting lines provided substantially parallel to the longitudinal sides;

two second cutting lines provided substantially parallel to the transverse sides so as to connect the two first cutting lines to each other to form a substantially rectangular-shaped central opening between the two first cutting lines;

a total of four third cutting lines, provided substantially parallel to the transverse sides and extending from both ends of the respective first cutting lines to extend in opposite directions from the central opening; and

a total of four fourth cutting lines provided between the transverse sides and the central opening, extending inward and substantially parallel to the transverse sides from the pair of longitudinal sides, wherein inner piece portions interposed between the pairs of third cutting lines opposed to and substantially parallel to each other and outer piece portions interposed between the pairs of fourth cutting lines opposed to and substantially parallel to each other are bent in a manner to cause the respective first cutting lines and the longitudinal sides which are adjacent to each other to approach each other, whereby at least two slot cell portions having a substantially U-shaped cross section can be formed, and those portions which are interposed between the third cutting lines and the transverse sides form the phase insulation portions.

12. The insulating paper piece for electric motors according to claim 9, wherein fifth cutting lines having a predetermined length and provided substantially parallel to the first cutting lines are connected to the third cutting lines, and portions interposed between the fifth cutting lines and the first cutting lines are turned back away from the third cutting lines, whereby it is possible to form cuff portions projecting from the slots of the stator core and turned back toward an end surface of the stator core.

13. The insulating paper piece for electric motors according to claim 9, wherein reinforcement paper pieces serving as cuffs and which have been separately prepared are applied to those ends of the inner piece portions which directly face the third cutting lines, to make these ends have a larger thickness than other portions, thus enabling formation of cuff portions without turning-back the paper.

14. The insulating paper piece for electric motors according to claim 9, wherein the second cutting lines and the third cutting lines are provided on the same lines.

15. The insulating paper piece for electric motors according to claim 12, wherein the second cutting lines and the third cutting lines are provided on the same lines.

16. The insulating paper piece for electric motors according to claim 9, wherein the second cutting lines and the third cutting lines are arranged such that a spacing between the two second cutting lines is larger than a spacing between the two of the third cutting lines; and sixth cutting lines, are provided on extensions of the second cutting lines in parallel and directly facing the third cutting lines, and wherein by bending the portions interposed between the third cutting lines and the sixth cutting lines in the same direction that the inner piece portions are bent, an upright covering portion in the vicinity of boundary between the slot cell portion and the phase insulation portion can be formed to cover the coil ends of the single pole coil.

17. The insulating paper piece for electric motors according to claim 12, wherein the second cutting lines and the third cutting lines are arranged such that a spacing between the two second cutting lines is larger than a spacing between the two of the third cutting lines; and sixth cutting lines, are provided on extensions of the second cutting lines in parallel and directly facing the third cutting lines, and wherein by bending the portions interposed between the third cutting lines and the sixth cutting lines in the same direction that the inner piece portions are bent, an upright covering portion in the vicinity of boundary between the slot cell portion and the phase insulation portion can be formed to cover the coil ends of the single pole coil.

18. The insulating paper piece for electric motors according to claim 9, wherein the second cutting lines and the third cutting lines are arranged such that the spacing between the two second cutting lines is smaller than the spacing between two of the third cutting lines, and by bending portions which have their ends at the second cutting lines, so that the bending portions approach the transverse sides, underside covering portions covering a part of those portions of the coil ends of the single pole coil which directly face the stator core can be formed.

19. The insulating paper piece for electric motors according to claim 12, wherein the second cutting lines and the third cutting lines are arranged such that the spacing between the two second cutting lines is smaller than the spacing between two of the third cutting lines, and by bending portions which have their ends at the second cutting lines, so that the bending portions approach the transverse sides, underside covering portions covering a part of those portions of the coil ends of the single pole coil which directly face the stator core can be formed.

20. An electric motor of a distributed winding structure, comprising:

a plurality of single pole coils arranged on a stator core, the coil ends of the single pole coils which protrude from both end surfaces of the stator core arranged so that portions of coils of different phases overlap one another; and

insulating paper pieces for electric motors, arranged on the stator core to heighten electrical insulation in areas where the single pole coils adjoin, wherein at least some of the insulating paper pieces for electric motors are insulating paper pieces for electric motors according to claim 1 and each insulating paper piece contains at least two slot cell portions arranged in two slots of the stator core, in which two portions of one single pole coil are inserted, and two phase insulation portions arranged to connect respective ends of the two slot cell portions to form loops and disposed to face directly against coil ends of the single pole coil; and the phase insulation portions are arranged between the adjacent ends of coils of different phases.